

A 1% and 1 cm Perspective Leads to a Novel CDOM Absorption Algorithm

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ABSTRACT

A next-generation in-water profiler designed to measure the apparent optical properties of seawater was developed and validated across a wide dynamic range of water properties. This new Compact-Optical Profiling System (C-OPS) design uses a novel, kite-shaped, free-falling backplane with adjustable buoyancy and is based on 19 state-of-the-art microradiometers, spanning 320-780 nm. Data collected as part of the field commissioning were of a previously unachievable quality and showed that systematic uncertainties in the sampling protocols were discernible at the 1% optical and 1cm depth resolution levels. A sensitivity analysis as a function of three water types, established by the peak in the remote sensing reflectance spectra, revealed which water types and spectral domains were the most indicative of data acquisition uncertainties. The unprecedented vertical resolution of C-OPS measurements provided near-surface data products at the spectral endpoints with a quality level that has not been obtainable. The improved data allowed development of an algorithm for predicting the spectral absorption due to chromophoric dissolved organic matter (CDOM) using ratios of diffuse attenuation coefficients with over 99% of the variance in the data explained.